**Unit Title**: How Fast Can You Go?

**Grade Level**: 9 - 10

**Time Frame**: 1 week (approx. 3 classes longer than an hour)

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| **Unit Description:**  Students will build a Louvee-air car to apply their skills and knowledge to:   * graphing linear equations using slope-intercept, point-slope, and x- and y-intercept techniques; * determining the slope of a line when given the graph of a line, two points on the line, or the equation of the line; and * determining the equation of a line when given the graph of the line, the slope and a point on the line, or two points on the line.   Students will thenwrite and present a report that shows:   * the data the group collected from their Louvee-air car; * student-created graph with slope of the line and equation for prototype; and * student-created graph with slope of the line and equation for final. | | | |
| **Big Ideas:**   * Linear equations can represent real-world relationships * Students will be able to graph distance vs. time from their Louvee-air car data, determine the average speed from the slope, and determine the equation of the line. | | **Essential Questions:**   * How do you graph a linear equation? * How do you determine slope? * How do you determine the equation of a line? | |
| **Performance Task:**  You are an engineer that has been asked to design the fastest Louvee-air car that travels in a straight line. You will then create a report to show your car’s speed. You will log all of your plans and thoughts in an Engineering Journal and share your report out to the car design panel. Final judging will be done based on the Car Report and presentation. Thank you for delving into your creativity as you build the fastest Louvee-air car ever!! | | | |
|  | **Benchmarks and Processes** | | **Concepts and Criteria** |
| **S**cience | SC.PS.6.2: Explain how the law of conservation of energy is applied to various systems  SC.PS.7.1: Apply the laws of motion to determine the effects of forces on the linear motion of objects.  SC.PS.7.2: Use vectors to explain force and motion | | **Conservation of Energy, Newton’s Laws of Motion, Vectors, Linear Motion** |
| **T**echnology | CTE:9-12.2.3: Apply appropriate and safe behaviors and practices in the school, community, and workplace | | **Safety** |
| **E**ngineering | **The Engineering Design Process**  **Ask:**  ·         Understand the problem ·         State the conditions and limitations ·         Obtain information from prior knowledge **Imagine:**  ·         Brainstorm ideas (don’t spend too much time here) **Plan:**  ·         Choose a testable idea ·         Draw a useable prototype ·         Use obtainable, affordable, and safe materials **Create:**  ·         Follow the plan and make it work **Experiment:**  ·         Collect, record, and analyze data accurately **Improve:**  ·         Review data ·         Use data to repeat process to optimize  **Teacher:** Review pitfalls and successes of the Car designs.  Check for understanding and clear misconceptions. | | **Ask, Imagine, Plan, Create, Experiment, Improve, Brainstorm, Prototype, Optimize** |
| **M**athematics | MA.Al.8.1: Graph Linear equations using slope-intercept, point-slope, and x- and y-intercept techniques  MA.Al.8.2: Determine the slope of a line when given the graph of a line, two points on the line, or the equation of the line  MA.Al.10.4: Determine the equation of a line when given the graph of the line, the slope and a point on the line, or two points on the line   |  | | --- | | F.IF.7: **Analyze functions using different representations**. *Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\**  *a. Graph linear and quadratic functions and show intercepts, maxima, and minima.*  A.CED.2: **Create equations that describe numbers or relationship**. *Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.\** | | S.ID.7: **Interpret linear models**. *Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.\** |   **(Math CCSS***)* | | **Slope, Graphing, Y-Intercept, Point-Slope, Function, Linear Function, Quadratic Function, Variable** |
| **STEM Competencies:**   * Indicator 3.3: Generates new and creative ideas and approaches to developing solutions | | | |

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| **Lesson Sequence** | | |
|  | **Lesson Title/Description** | **Time Frame** |
| 1 | Review slopes and linear equations:  a) Graphing linear equations  b) Determining the slope of a line  c) Determining the equation of a line. | 40 min. |
| 2 | After teacher instruction on content, teacher will pass out the PracticeGraphing Worksheet:   1. create a graph from a set of data 2. determine the slope of the line 3. write the equation of the line. | 20 min. |
| 3 | Build a Louvee air car—student in pairs, materials needed, timeframe, etc. . . | 1 hour |
| 4 | **Performance task:**  You are an engineer that has been asked to design the fastest Louvee-air car that travels in a straight line. You will then create a report to show your car’s speed. You will log all of your plans and thoughts in an Engineering Journal. You will share your report out to the car design panel. Final judging will be done based on the Car Report and presentation. Thank you for delving into your creativity as you build the fastest Louvee Air Car ever!! | 1 hour |